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Selective Information Processing of Body Size and Food Related Stimuli in Women Who Are Preoccupied With Body Size.

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SELECTIVE INFORMATION PROCESSING OF BODY SIZE
AND FOOD RELATED STIMULI IN WOMEN WHO ARE
PREOCCUPIED WITH BODY SIZE

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The Department of Psychology

by

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ABSTRACT

Overconcern or preoccupation with body size and weight is a central psychopathological feature of the eating disorders. The overconcern with body size is considered to be a function of fear of weight gain or "fear of fatness". Cognitive theories of psychopathology have hypothesized that fear results in an increased activation of cognitive structures associated with the feared object. This increased activation (priming) is hypothesized to enhance the processing of information related to the feared object. This study tested this hypothesis using a lexical decision task. Individuals with extreme body size preoccupation were evaluated for a selective information processing of body size related words and food related words. Subjects with high body size preoccupation, i.e. a score of 110 or greater on the Body Shape Questionnaire (BSQ), correctly identified significantly more food and body words when compared to subjects with low concern about body size, i.e. a score of 50 or less on the BSQ. The groups did not differ on identification of control words. These results were interpreted as support for the anxiety model of eating disorders and cognitive theories of psychopathology.

INTRODUCTION

Recent research pertaining to the eating disorders has tested a theoretical model which posits that extreme efforts to control body size are motivated by fear of fatness (Leitenberg, Gross, Peterson, & Rosen, 1984; Rosen & Leitenberg, 1982; Williamson, 1990; Willmuth, Leitenberg, Rosen & Cado, 1988). This theory has been called the anxiety model of eating disorders. The theory contends that fear of weight gain is a central psychopathological feature of both anorexia nervosa and bulimia nervosa (Garner & Bemis, 1982; Rosen & Leitenberg, 1982; Slade, 1982). It is generally assumed that fear of weight gain is associated with excessive preoccupation with body size and weight and behavior aimed at avoiding weight gain. According to Rosen (1993) eating disorder patients exhibit an "obsessive-like preoccupation" with their body shape, body weight and eating. The "obsession" with body size and weight has been shown to be correlated with selective cognitive processing of body size related stimuli (Ben-Tovim, Walker, Fok & Yap, 1989; Channon, Hemsley & de Silva, 1988; Schotte, McNally & Turner, 1990). The preoccupation with body size and shape is not limited to clinical subjects; nonclinical, individuals of normal weight status also report overconcern with body size and shape (Cash, Winsted & Janda, 1985). The present

study examined selective information processing of weight related stimuli in three groups of nonclinical subjects with normal weight status. The subjects ranged from high to low on a measure of body size preoccupation.

In a review of the literature pertaining to this study, the anxiety model of eating disorders will first be reviewed. Next, the literature on information processing biases in anxiety disorders and the content specificity hypothesis will be presented. Third, information processing associated with priming and integration theory will be discussed. Fourth, the literature on information processing in eating disorders will be reviewed. Finally, a study designed to investigate the cognitive processing biases associated with the preoccupation with body size and weight will be described.

The Anxiety Model of Bulimia and Anorexia Nervosa

One of the diagnostic criteria for anorexia nervosa is an intense fear of becoming fat (Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, 1994). This "fear of fatness" is thought to produce intense anxiety, which motivates extremely restrictive eating and leads to substantial weight loss (Schlundt & Johnson, 1990; Williamson, 1990). Stringent dietary restraint reduces the anxiety associated with possible weight gain and is therefore, negatively reinforced in

anorexia nervosa. Fear of weight gain is not a diagnostic criterion for bulimia nervosa, but it has been proposed to be functionally related to the etiology and maintenance of bulimia nervosa (Rosen & Leitenberg, 1982; Schlundt & Johnson, 1990; Williamson, 1990). Both anorexics and bulimics attempt to avoid anxiety associated with small gains in body weight by employing restrictive eating. Bulimics often lose control of restrictive eating and binge. Binge-eating causes anxiety and worry/obsessional thinking regarding body size and weight (Rosen & Leitenberg, 1982; Rosen & Leitenberg, 1984; Mizes, 1985; Williamson, Prather, Goreczny, Davis, & McKenzie, 1989; Schlundt & Johnson, 1990), while purging functions to reduce this anxiety, thus "undoing" the feared consequences of a binge, i.e. weight gain. Thus, the fear of fatness is believed to result in anxiety, which motivates eating disorder patients to engage in extreme weight control methods aimed at reducing this anxiety.

Fear of fatness is believed to stem from the negative consequences Western culture associates with fatness (Morris, Cooper, & Cooper, 1989; Schlundt & Johnson, 1990) and the desirability associated with thinness. Thinness has been equated with success, happiness, and positive self-esteem, especially in women (Fallon & Rozin, 1985; Franzio & Herzog, 1987), while obesity is considered a

social stigma (Bray, 1986). When presented with pictures representing various disabilities, both children and adults indicated that obesity is the type of disability they would least prefer (Goodman, Richardson, Dornbusch, & Hastorf, 1963; Maddox, Back, & Liederman, 1968). Obesity may also create obstacles to employment and promotion (Matusewich, 1983; Rothblum, Miller, & Garbutt, 1988). Morris, et al (1989) found that the figures of fashion models have become less curvaceous and more slender over the past 20 years. Hence, the body shape of women that is commonly presented within fashion magazines has become increasingly thinner. However, these attitudes may not be gender specific, cultural identification may be the strongest influence on body size preoccupation. Siever (1994) reported that lesbians and heterosexual males were less dissatisfied with their body size than male homosexuals and heterosexual women, with the heterosexual females reporting the most extreme dissatisfaction. Furthermore, lesbians viewed physical attractiveness and appearance as less important than homosexual men and heterosexual men and women. Although Western culture's "thin is in" attitude and disdain for fatness may affect both genders, the degree of body size dissatisfaction and prevalence of body size preoccupation is higher in young women than young men. The population of interest in this

study was young women with varying degrees of body size preoccupation.

Direct Tests of The Anxiety Model

Anxiety, measured by various methods, has been reported to occur in bulimics following ingestion of food (Duchmann, Williamson, & Stricker, 1989; Leitenberg, Gross, Peterson, & Rosen, 1984; Rosen & Leitenberg, 1982; Willmuth, Leitenberg, Rosen, & Cado, 1988). For example, ingestion of a modest sized meal (lunch sandwich, potato chips, and a soft drink) produced physiological signs of anxiety in a group of bulimics when they were prevented from purging (Williamson, Goreczny, Davis, Ruggiero, & McKenzie, 1988).

Also, several studies have found that bulimic subjects eat less when they are prevented from purging (Duchmann, Williamson, & Stricker, 1989; Rosen, Leitenberg, Fondacaro, Gross & Willmuth, 1985; Willmuth, Leitenberg, Rosen, & Cado, 1988). Rosen et al (1985) found that bulimics ate substantially less than control subjects on three separate occasions. Bulimia nervosa subjects were also found to be preoccupied with food, appearance, and the possibility of weight gain during and after eating, whereas control subjects attended to matters other than food immediately after eating.

Duchmann et al (1989) found that, following a preload, bulimics, that were not allowed to purge, ate less during a laboratory "taste test" than binge-eaters who did not purge. Subsequent to the experiment, self-reported anxiety was somewhat greater for the bulimia nervosa subjects in comparison to binge-eaters and was significantly greater than that of normal control subjects, even though bulimics ate less than both groups. In three test meals, Willmuth et al (1988) also reported restrictive eating in a sample of purging bulimics.

Fear of weight gain and overconcern with body size and weight have been proposed as motivating factors for the avoidance of certain foods (Fairburn, Cooper & Cooper, 1986; Garner & Bemis, 1982; Schlundt & Johnson, 1990). Eating disorder patients strongly endorse the belief that avoidance of certain foods is necessary for weight loss or maintenance. Ruggiero, Williamson, Davis, Schlundt and Carey (1988) reported that bulimics anticipate more negative emotional reactions than normals or obese subjects to eating high caloric, "fattening" foods. Cooper and Fairburn (1992) found that anorexia nervosa patients exhibited greater concerns about eating than bulimics. However, both groups reported more concern about eating in comparison to the control group. These studies suggest that preoccupation with eating is

associated with bulimia nervosa and anorexia nervosa. This overconcern with certain foods is assumed to be a secondary effect of the fear of fatness and preoccupation with body size and weight.

Evidence for the anxiety model of anorexia nervosa is somewhat limited, but for bulimia nervosa, it has received considerable support. Avoidant (restrictive eating) and escape (purging) behavior appear to be motivated by the anxiety stemming from a "fear of fatness". Both anorexia and bulimia nervosa patients attempt to restrict their eating and will resort to purgative methods if their strict diet is unsuccessful. Thus, anxiety associated with the fear of fatness is viewed as the major contributing factor in the etiology and maintenance of both bulimia and anorexia nervosa.

Information Processing Studies of the Anxiety Disorders

Information processing has been described as the attending, coding, manipulation, storing, and retrieval of internal and external stimuli (Marx & Cronan-Hillix, 1987). Biases of information processing have been implicated in the etiology and maintenance of some psychological disorders. Findings from studies of various psychological disorders indicate that information processing biases are specific to stimuli related to the

concerns of a particular disorder (Daggleish & Watts, 1990; Greenberg & Beck, 1989; Williams, Watts, MacLeod & Mathews, 1988). This finding has been referred to as the "content-specificity hypothesis" (Greenberg & Beck, 1989). For example, biases of attention are associated with anxiety disorders, and are particularly strong for stimuli related to the content of a person's specific fear or worry. In summary, this research suggests that stimuli related to the individual's fear is selected for processing over other information that is unrelated to the area of concern.

Methods employed to measure attentional bias include dichotic listening tasks, visual dot probe tasks, and color-naming of emotionally charged words. The color-naming task is best viewed as an interference effect produced by the differential processing of mood-congruent words. The dichotic listening and dot probe tasks, on the other hand, assess attentional deployment more directly.

Watts, McKenna, Sharrock and Trezise (1986) found an interference effect with spider phobics in a modified Stroop color naming task. After the spider phobics received desensitization treatment the interference effect was significantly reduced. Giles and Cairns (1989) used violent words, considered to be related to the unrest in Northern Ireland, to produce a "Violent Stroop Test" which

was presented to three groups: natives of Northern Ireland, English students living in Northern Ireland and English students living in England. Only the English students in Northern Ireland exhibited an interference effect. Both Watts et al (1986) and Giles and Cairns (1989) concluded that the interference effect was due to the anxiety associated with the stimuli, not expertise or experience with the items contained in the Stroop.

Using a dichotic listening task in conjunction with a reaction time task, Mathews and MacLeod (1986) found that generalized anxiety disorder (GAD) subjects' responded significantly slower when threat words were presented in the unattended channel than when neutral words were presented. The tape recorder was stopped periodically and the subjects asked to report the last word presented in the unattended channel. Most subjects denied hearing any words, while some reported being aware of one or two neutral words. Since subjects were unaware of the stimuli in the unattended channel, Mathews and MacLeod concluded that the GAD subjects' increased reaction times, associated with the presentation of the threat words, were a result of a preattentive processing bias.

Mathews, May, Mogg, and Eysenck (1989), used a modified dot probe technique which demonstrated that currently anxious and recovered subjects were more

distracted by threatening material than non-threatening material. MacLeod, Mathews, and Tata (1986) used a dot probe method and found an attentional bias for threat words in subjects who met the DSM-III-R criteria for GAD.

Williams, Watts, MacLeod and Mathews (1988) explained attentional bias or attentional capture in terms of Graf and Mandler's (1984) integration theory of mental representations or schemas. Integration is defined as the mutual activation of the different cognitive components of a single schema. This activation of the component parts of a schema can also be referred to as "priming". Integration or priming is thought to be automatic and results in a strengthening of an internal representation of a stimulus. The culmination of such cognitive processes is increased accessibility of the information stored in that schema. Thus, stimuli related to the schema are more likely to be perceived when any components of the stimuli are presented. According to the cognitive model, the initial selective processing of feared stimuli is automatic, rapid, and occurs outside conscious awareness or pre-attentively (Williams, et al, 1988).

Eysenck, MacLeod and Mathews (1987) proposed that anxiety patients allocate pre-attentive processing resources toward the detection of feared stimuli while non-disturbed subjects orient resources away from the

location of a threatening stimulus. Increased allocation of resources is functionally equivalent to multiple exposures to the stimuli of concern (Williams, et al 1988). Hence, the mental representations of items related to a specific concern will be primed and the likelihood of these stimuli being processed further and capturing attention will be enhanced.

Effects of Priming on Information Processing

A number of studies have shown that both supraliminal and subliminal priming enhances the subsequent ability to accurately perceive the same words or related words (Cloitre & Liebowitz, 1991; Hill & Kemp-Wheeler, 1989; Jacoby & Dallas, 1981; Kemp-Wheeler & Hill, 1992). In a series of studies Jacoby and Dallas (1981) evaluated the extent to which the level of cognitive processing affects detection of a briefly presented stimulus. In each of these studies, a list of words was presented for the subjects to study. During the study phase the depth of processing was manipulated by asking subjects to either respond to questions regarding each word (e.g. types of letters in the word; whether it rhymes with another word; or the meaning of the word), solve anagrams, or repeat the word aloud a number of times. Following these priming tasks the words from the study list were presented, along with an equal number of filler words, on a tachistoscope

for 35 milliseconds (msec). During the tachistoscopic presentation subjects were required to perform a lexical decision task, which involved identifying the word presented. The results indicated that, regardless of the type of processing performed on the word, primed words were significantly more likely to be identified than non-primed words.

Hill and Kemp-Wheeler (1989) investigated the extent to which emotionally or semantically related primes decreased the latency of a lexical decision task. Each target word was immediately preceded by the supraliminal presentation of either a non-related prime, a semantically related prime or an emotionally related prime. The results indicated that lexical decisions were made significantly faster when the prime and target were semantically or emotionally related. Kemp-Wheeler and Hill (1992) reported the same results with subliminally presented emotionally or semantically related primes.

Cloitre and Liebowitz (1991) used a modified lexical decision task to investigate the response of panic disorder patients and control subjects to threat words, positive words, and neutral words. As in the Jacoby and Dallas (1981) experiment, a study phase was used to manipulate the depth of processing. The study phase was divided into two stages: during one stage, subjects were

instructed to determine whether a letter string represented a word or not; and in the second stage, subjects indicated whether a word represented a feeling state or not. Stimuli in the lexical decision task included half of the previously presented words and an equal number of "new" words balanced across the three types of words. This set of words was flashed on a computer screen for 35 msec. and subjects were asked to respond as quickly as possible with a **yes** or **no** as to whether they recognized the word from the study list. They found that the panic disorder subjects recognized significantly more threat related words than control subjects, and this effect was independent of the level of processing performed during the study phase.

These studies suggest that priming has at least two effects on lexical decision tasks: 1) Priming significantly increases the likelihood that a word will be recognized following a brief presentation and, 2) priming significantly decreases the latency to recognize a word. These effects appear to be independent of the depth of processing; e.g. verbal rehearsal, meaning of the word, types of letters in the word. Furthermore, Cloitre and Liebowitz (1991) reported that priming, as measured by the correct detection of a previously seen word, is enhanced when the word is related to an individual's area of

concern. Williams et al (1988) proposed that mental representations associated with an individual's area of concern are primed due to mutual activation of the component parts of the representation. If the cognitive structures associated with a person's concern are primed, the two effects on lexical decision tasks described above should be observed when stimuli related to the specific concern are presented.

Information Processing Studies of the Eating Disorders

Selective information processing of body size and food related words has been found in eating disorder patients. Using a modified Stroop procedure, Ben-Tovim, Walker, Fok, and Yap (1989) found that subjects diagnosed with anorexia and bulimia nervosa responded slower in color naming food words, while only the bulimic group exhibited a significant interference effect in response to shape words. Fairburn, Cooper, Cooper, McKenna and Anastasiades (1991) used a color-naming task that combined eating, shape and weight words into one Stroop card to assess interference between male and female controls and bulimic subjects. They reported a significant interference effect for the bulimia nervosa group that was specific to eating, shape and weight words. In a replication study, Cooper, Anastasiades and Fairburn

(1992) reported a significant interference effect for bulimia nervosa patients. Channon, Hemsley and de Silva (1988) reported a significant disruption of color-naming food-related words in a group of anorexia nervosa patients. These results appeared to be a function of current concerns with food and eating. The studies using the Stroop Test method provide evidence that bulimics and anorexics differentially process information related to both body size or food. During a dichotic listening task bulimics exhibited larger skin conductance response than normal controls when the word "FAT" was presented in either the attended or unattended channel (Schotte, McNally, & Turner, 1990). Results showed that bulimics detected "FAT" on the unattended channel more often than they detected the other target word (PICK). These data suggest that somewhat innocuous stimuli (words) related to body size may be sufficient to produce some sympathetic arousal and capture the attention of subjects diagnosed with bulimia nervosa.

The selective processing of food has also been found to affect self-report food monitoring data (Gleaves, Williamson & Barker, 1993; Williamson, Gleaves & Lawson, 1991). Both studies found that as caloric intake increased, eating disorder subjects were more likely to report overeating than normal controls. Gleaves et al.

(1993) also found that a binge was more likely to be reported by bulimia nervosa subjects when "fattening" or "forbidden" foods were eaten. Both studies concluded that these findings suggest that eating disorder subjects are hypervigilant for potentially threatening stimuli, i.e. fattening or high caloric foods, which leads to over-reporting of binges and episodes of overeating.

Other cognitive biases have also been found to be associated with eating disorders and subjects reporting extreme body size preoccupation. Two recent unpublished studies found a recall memory bias for fat-related body size words in a group of eating disorder subjects and normal weight subjects scoring high on the BSQ (Sebastian, Williamson & Blouin, 1993; Baker, Williamson, & Sylve, 1993). Jackman, Williamson, Netemeyer & Anderson (in press) reported that weight preoccupied female athletes interpreted self-referenced ambiguous body-related sentences as indicative of a fat body size. Anxious subjects have also been found to disambiguate neutral sentences with a threatening interpretation (Eysenck, Mogg, May, Richards & Mathews, 1991).

The similarities in information processing between anxiety disorders and eating disorders is best explained by the content-specificity hypothesis (Greenberg & Beck, 1989). It is possible that the fear of fatness produces

an increased preoccupation with body size and weight, which enhances the awareness of body size related stimuli (Williamson, Barker & Norris, 1993). Based upon this review, it is concluded that the integration/priming theory proposed by Williams, et al (1988) to explain attentional biases, could be applied to the selective information processing found in eating disorders.

Historical Perspective

The idea of selective processing of emotionally charged stimuli dates to at least the late 1940's. Bruner and Postman (1947a) suggested that the perception of external stimuli is significantly affected by attitudes, values, expectancies, needs, and psychodynamic defenses. This selective processing was postulated to result in either "perceptual vigilance" (Bruner & Postman, 1947a) or "perceptual defense" (Bruner & Postman, 1947b). Perceptual vigilance refers to the relative lowering of recognition thresholds so that certain emotional stimuli are more readily detected than other stimuli. Perceptual defense is defined as the relative elevation of recognition thresholds which reduces the likelihood of noticing particular emotional stimuli. This theory of perception was loosely referred to as the "New Look" (Erdelyi, 1974).

Basically two methodological approaches were used to evaluate both perceptual vigilance and defense. One method measured perceptual responses to stimuli believed to possess some preexisting emotional significance for each subject. The other approach experimentally manipulated the emotional significance of the target stimuli. Classical or respondent conditioning was used to make neutral stimuli emotionally salient. Studies employing the former method will be described first, followed by examples of the latter approach.

Bruner & Postman (1947a) found a curvilinear relationship between word association response times and recognition thresholds. Three sets of six words that produced either fast word association reaction times (low anxiety arousing), medium word association reaction times (mild anxiety arousing), or slow word association reaction times (high anxiety arousing) were identified for each subject. These eighteen words were presented randomly on a tachistoscope and subjects were instructed to report the word they saw or the word they thought they saw after each exposure. Results showed that recognition thresholds initially increased as a function of word association reaction time, then decreased. When the emotionality of the words increased to a certain level, latency to identify these "taboo" words decreased significantly.

Bruner and Postman hypothesized that a perceptual defense mechanism functions to protect a person against anxiety until the emotionality of the stimulus becomes too great, at which point perceptual vigilance begins to operate. Other similar studies that used word association latencies to identify the appropriate emotional stimuli to present reported perceptual defense and not vigilance (Bootzin & Natsoulas, 1965; Mathews & Wertheimer, 1958). Selective perceptual reactions were not only reported to occur in response to "dangerous" stimuli but also highly valued stimuli (Postman, Bruner, & McGinnies; 1948).

Postman, Bruner and McGinnies (1948) compared subjects' ratings of six categories of beliefs (theoretical, economic, aesthetic, social, political and religious), as measured by the Allport-Vernon Study of Values, with recognition thresholds to stimulus words related to each category. Stimulus words presented tachistoscopically were recognized at significantly shorter exposure times when the words were related to categories most valued by the subject. Postman et al interpreted the results as supportive of the concepts of perceptual vigilance and perceptual defense. Subjects were selectively vigilant toward material that was consistent with their values (perceptual vigilance) but

blocked the processing of information unrelated to areas of interest (perceptual defense).

Along with attitudes about certain topics, personality traits were used as predictors of perceptual reactions (Gurtman & Lion, 1982; Tuma, 1975). Carpenter, Wiener and Carpenter (1956) reported that individuals who used sensitizing or "alertness" defenses in a particular conflict area were vigilant toward words related to that area. Tuma (1975) found that there was an interaction between stress and extraversion/introversion. Extraverts exposed to a high level of experimental stress exhibited perceptual defense while introverts responded with perceptual vigilance. The reverse was observed when subjects were exposed to a lower level of experimental stress.

A number of studies evaluated the perceptual reactions to stimuli whose emotional significance was experimentally induced. For example, Bruner and Postman (1947b) found that the accuracy of size estimations improved when the object being appraised was paired with electrical shock. The physical and geometric properties of the object became more relevant when associated with a stressful situation, which resulted in more accurate estimation of the size of the object. Bootzin and Stephens (1967) found that perceptual vigilance could be

produced for inherently neutral stimuli (geometric shapes) when those stimuli were paired with academic failure. Previously neutral words associated with failed attempts to produce anagrams were also correlated with both vigilance and defense (Spence, 1956).

There are a number of flaws in these studies including response bias, poor controls, misguided interpretations of the data, and flawed methodologies. However, these studies have influenced subsequent research on selective information processing. Instead of manipulating the emotionality of stimulus material, recent research has applied the theory of perceptual vigilance to the relationship between pre-existing mood states, emotionally valenced stimuli and information processing procedures.

Population of Interest

The negative consequences associated with being overweight correspond to a Western cultural emphasis upon thinness, which is especially intense for women (Brownell, 1991; Schlundt & Johnson, 1990). Over the last 20 years sociocultural emphasis on thinness and dissatisfaction with body size has increased (Berscheid, Walster, & Borhnstedt, 1972; Cash, Winstead, & Janda, 1985; Morris, Cooper, & Cooper, 1989). Recently, both sexes have been shown to agree that a thin, slender size is the preferred

body shape for women (Fallon & Rozin, 1985; Franzio & Herzog, 1987).

With this pervasive "thin is in" attitude it is no wonder millions of young women have adopted the cultural ideal of the tall thin fashion model. One unfortunate consequence of these sociocultural influences is that many women have adopted a goal for their appearance that is unattainable (Brownell, 1991), causing them to be chronically preoccupied with body size and dieting. Such persons typically feel they are too fat, are afraid they are unattractive, and fear rejection because they are overweight (Schlundt & Johnson, 1990).

Fear of fatness is believed to stem from the negative consequences Western culture associates with fatness (Morris, Cooper & Cooper, 1989; Schlundt & Johnson, 1990). A natural consequence of fear is worry or overconcern for stimuli associated with the feared object or situation. Williamson, Barker and Norris (1993) proposed that overconcern with body size and weight occurs in response to fear of fatness. In order to achieve or maintain the culturally preferred body size, thus avoiding the negative consequences associated with fatness, a heightened awareness of body size related stimuli may occur in some persons. The pervasiveness of sociocultural influences regarding body size and shape is likely to strongly impact

nonclinical normal weight individuals and their attitude toward body size. Research evidence indicates that some nonclinical subjects report preoccupation with body size and weight (Cash, Winstead, & Janda, 1986; Heilbrun & Hausman, 1990). Research investigating information processing in nonclinical individuals who report an overconcern with body size and weight is somewhat limited, however. The present study was designed to examine information processing of weight related stimuli in subjects preoccupied with body size, but who had not developed an eating disorder.

PROBLEM

Sociocultural emphasis upon thinness for women is much stronger and thus, is assumed to be a major contributing factor in the disproportionate number of eating disorders found in women versus men (Brownell, 1991; Schlundt & Johnson, 1990; Williamson et al, 1993). The anxiety model of anorexia and bulimia nervosa proposes that the pathological eating habits of persons diagnosed with an eating disorder are motivated, in part, by a fear of fatness (Rosen & Leitenberg, 1982; Schlundt & Johnson, 1990; Williamson, Barker & Norris, 1993). This fear of fatness presumably results in worry/overconcern with "fattening" foods and body size and weight, which is associated with an attentional bias for fatness, food, and stimuli related to body size (Ben-Tovim, et al, 1989; Channon, et al, 1988; Schotte, McNally & Turner, 1990). One consequence of an attentional bias is that the detection of body and food stimuli should be enhanced (Mathews et al, 1989). Heightened awareness for stimuli related to a person's concerns has been proposed to be a function of integration or internal priming (Williams et al 1988). Subliminal and supraliminal priming has been found to enhance the speed and accuracy of detecting stimuli semantically or emotionally related to the prime (Hill & Kemp-Wheeler, 1988; Kemp-Wheeler & Hill, 1992).

If external priming improves performance on a lexical decision task, then internal priming is likely to produce the same effect. Based upon this reasoning, individuals who report an overconcern with body size should exhibit better accuracy for perception of food- and body shape-related words when compared to subjects with a moderate or low concern about body size.

Research Design

In this study a lexical decision task, involving the brief presentation of words related to body size and food, matched neutral words, and nonword letter strings, was used to assess information processing in three groups of women that varied on a measure of body size preoccupation. The methodology was similar to that employed by Jacoby and Dallas (1981). Twenty body size words, 20 food words, 40 neutral words and 80 nonword letter strings were presented on a computer monitor for 35 milliseconds (msec). To direct the subjects gaze to the appropriate area of the computer screen a plus sign (+) functioned as a fixation point and preceded the presentation of each stimulus. A pattern mask, consisting of an equal or greater number of X's as there were letters in the word or nonword, immediately followed the presentation of a stimulus. The pattern mask was used to interfere with the visual icon produced by the word or nonword. Subjects were instructed

to indicate whether a word or a nonword was presented by pressing a keyboard button marked **YES** or **NO**. The subjects were instructed that "**YES** means a word was presented and **NO** means a nonword was presented". The mask remained on the screen until the subject responded. Neutral words that were matched with the target words on length and frequency were also presented. In order to control for response bias, an equal number of words and nonword letter strings were included in the lexical decision task, resulting in a total of 160 presentations. Thus, a chance responding would yield a 50% hit rate for words and nonword letter strings. Following each **YES** or **NO** decision, subjects were asked to rate how confident they were that their response was correct using a 5-point rating scale. The subject's response terminated the presentation of the rating scale and prompted the next trial.

As an example, the word **FAT** would replace the orienting mark (+) on the computer screen and then would be presented for 35 ms. The word was then followed immediately by the X pattern mask. The subject then made a decision as to whether a word or nonword was presented by pressing the key marked **YES** or the key marked **NO**. Following the subject's **YES/NO** response another screen was presented that instructed the subject to indicate, on a 5-

point rating scale, how confident she was that her decision was correct.

Data from the lexical decision task was not only used to evaluate preattentive processing, but also the presence of a response bias. If a subject tended to respond in one direction more so than the other to the presentation of the stimuli, a response bias was observed and this data was excluded from the study. For example, pressing only the YES response key would result in an overall hit rate of 50%, but 100% hit rate for word stimuli and 0% hit rate for nonwords.

Upon completion of the lexical decision task a measure of recognition memory was administered to rule out the presence of a memory bias. It is the hypothesis of this study that the selective processing of body size and food words associated with extreme body size preoccupation occurs in the absence of a memory bias. This prediction is based on the information processing model developed by Williams et al (1988). Anxiety is associated with an automatic preattentive processing bias but not with a strategic, conscious encoding process that improves the retrievability of threatening information (Mathews & MacLeod, 1985; Mogg, Mathews & Weinman, 1989). In order to assess this hypothesis a memory task was included to

evaluate the ability of subjects to later recognize the words presented in the lexical decision task.

Experimental Hypotheses

Hypothesis 1 - It was hypothesized that subjects scoring high on a measure of body size preoccupation would be more accurate in identifying body size words than subjects with moderate or low body size preoccupation. This hypothesis would be supported by higher correct identification of body size words by high body size preoccupied subjects. Since the selective processing was predicted to be specific to body size words, the correct identification of body size words by high body size preoccupied subjects was predicted to be greater than the detection of matched neutral words.

Hypothesis 2 - It was hypothesized that subjects high on body size preoccupation would be more accurate in identifying food words than subjects with moderate or low body size preoccupation. This hypothesis would be supported by higher correct identification of food words by high body size preoccupied subjects. Since the selective processing was predicted to be specific to food words, the correct identification of food words by high body size preoccupied subjects was predicted to be significantly greater than the detection of matched neutral words.

No group differences were expected for confidence ratings because the brief presentation of stimuli made it unlikely that subjects would be consciously aware of the stimuli. The methodology of the lexical decision task was designed to make subjects feel as though they were guessing, which should result in no differences between groups or across words on the confidence ratings. It should be noted that research has shown that conscious awareness of threat words is not necessary for performance to be significantly affected (Mathews & MacLeod, 1986; Mogg, Bradley, Williams & Mathews, 1993).

Groups are not expected to differ on recognition memory for words from the lexical decision task. Since subjects are unlikely to be consciously aware of the stimuli, the level of processing associated with enhanced memory was unlikely to occur. Furthermore, selective processing of threatening stimuli has been found to occur in the absence of a recognition memory bias (Mathews & MacLeod, 1985; Mogg, Mathews & Weinman, 1989).

METHOD

Subject Selection

Subjects were recruited from the undergraduate classes at Louisiana State University, University of Washington at Tacoma, and Pierce Community College. A total of 991 men and women participated in the preliminary screening, which involved administration of the Body Shape Questionnaire (BSQ), the trait portion of the Spielberger Trait Anxiety Inventory (STAI), Beck Depression Inventory (BDI) and Penn State Worry Questionnaire (PSWQ). Subjects were selected on the basis of sex and BSQ score; the other measures were administered as foils to reduce the subjects' ability to determine the exact nature of the experiment. Because only female subjects were recruited to participate in the laboratory experiment, approximately half of the subjects from the screening sample were eliminated on the basis of sex. The remaining subjects were stratified on the basis of BSQ score. Three groups of female subjects were constructed to represent individuals reporting high body size preoccupation ($BSQ \geq 110$; \geq one standard deviation above the mean), moderate body size preoccupation ($BSQ > 50$ and < 110), and low body size preoccupation ($BSQ \leq 50$; \geq one standard deviation below the mean).

Subjects from the screening sample were randomly selected, contacted by telephone and asked to participate in the laboratory experiment. Of the 155 individuals (138 from LSU, 5 from UWT and 12 from PCC) who were reached by phone, 4 declined to participate and 10 did not attend the scheduled appointment. In all, 141 subjects completed the lexical decision laboratory task.

A number of exclusion criteria were applied to the subjects following completion of the computer task. Since only normal weight subjects were desired for this study participants had to have a body mass index ($BMI = \text{weight in kilograms divided by height in meters squared}$) less than 27 and greater than 17. Caloric intake had to be greater than 1000 or 300 for subjects participating in the study during the morning hours or afternoon hours; respectively. Finally, an accuracy rate of .90 or greater for words or nonwords was considered an extreme response bias and subjects exhibiting such a performance were excluded from the study.

Five subjects were excluded from the study because of a low caloric intake on the day of the study (4 subjects from the high BSQ group and 1 subject from the middle BSQ group). Eighteen subjects were excluded from the study based upon finding a response bias in their performance on the lexical decision task (15 exhibited a NO response

bias, i.e. an accuracy rate of .90 or greater for nonwords and .10 or less for words, and 3 had a **YES** bias, i.e. an accuracy rate of .90 or greater for words and .10 or less for nonwords). Of the 18 subjects excluded on the basis of a response bias, 5 subjects were from the high BSQ group, 8 subjects were from the mid range BSQ group, and 5 subjects were from the low BSQ group. None of the subjects that participated in the computer task were excluded due to the presence of an eating disorder as defined by DSM-III-R.

The subjects recruited from Louisiana State University received extra credit, which could be applied toward coursework, for their participation in the study. No such incentives were offered by the other institutions.

Assessment Procedures

Body Shape Questionnaire. The Body Shape Questionnaire (BSQ) is a 34 item self-report measure designed to assess concerns about body shape (Cooper, Taylor, Cooper & Fairburn, 1987). Items were derived from interviews with eating disorder patients as well as nonclinical women of normal weight with excessive concern about body size and shape. Each item is answered using a 6-point Likert scale ("never", "rarely", "sometimes", "often", "very often", or "always"). The authors reported evidence for concurrent and discriminant validity. The

questionnaire correlated highly with other similar measures (Eating Attitudes Test and the Body Dissatisfaction scale of the Eating Disorder Inventory) and distinguished individuals who reported concerns with body size and those who denied such concerns. A sample of 535 women from the general population was studied with a mean of 80 and a standard deviation of 30. The reader is referred to Cooper et al (1987) for a copy of the BSQ.

Shipley Institutes of Living Scale. Since this study used words as stimuli, an estimate of each subject's vocabulary skills was obtained in order to rule out differences in vocabulary abilities. The Shipley Institutes of Living Scale consists of a vocabulary subscale and an abstraction subscale. In this study only the vocabulary subscale was used in order to estimate vocabulary skills. The Shipley has been found to have satisfactory reliability and validity as an estimate of intellectual ability (Goodman, Streiner & Woodward, 1974; Martin, Blair & Vickers, 1979). The reader is referred to Pollack (1942) for a full copy of the Shipley Institutes of Living Scale.

Interview for Diagnosis of Eating Disorders. The Interview for Diagnosis of Eating Disorders (IDED) was developed by Williamson (1990) to evaluate the core psychopathology of bulimia nervosa, anorexia nervosa,

compulsive overeating and obesity. The diagnostic criteria in DSM-III-R were used to develop questions for the diagnosis of anorexia and bulimia nervosa. The IDED criteria for compulsive overeating were based upon a modification of the DSM-III diagnosis of bulimia (American Psychiatric Association, 1980). The IDED was used to rule out the presence of an eating disorder. The reader is referred to Assessment of Eating Disorders: Obesity, Anorexia, and Bulimia Nervosa (Williamson, 1990; page 165-176) for a copy of the IDED.

24-Hour Recall of Food Eaten. The amount of food eaten has been reported to affect the information processing of food words (Channon & Hayward, 1990). Subjects were asked to report the type of food and the amount eaten over the past 24 hours. The number of calories consumed were calculated from the amount and type of food eaten and was used as an exclusion criteria. Subjects run in the morning were required to consume at least 1000 calories the previous day, while subjects that participated in the afternoon were required to have consumed a morning intake of 300 calories or more. A copy of the 24-Hour Recall of Food Eaten form can be found in Appendix A.

Target Words. The 20 body size and 20 food related words used in this study were those identified in previous

studies as negatively related to body size and as fattening food (Baker, et al., 1993; Fuller, 1991). All of these words were chosen on the basis of undergraduates' ratings (30 subjects in the Fuller study and 40 subjects in the Baker study) made of the words on the following: a) whether they had a positive or negative reaction to the word, b) how much they would like or dislike the word if it was used to describe them and c) whether the word was related to fatness. Only words identified by 80% of the raters to be negative and categorized as fat related were included in this study. Thus, the words used in this study received very extreme ratings and had been reliably categorized. A copy of the target words used can be found in Appendix C.

Experimental Design and Procedure

The independent variables in this study included 1) three groups based upon scores on the BSQ (high, middle, and low) and 2) word type. The dependent variable was the accuracy with which words and nonwords were detected. Subjects were selected on the basis of their scores on the BSQ. Since subjects with an eating disorder were to be excluded from the study, the presence of an eating disorder was evaluated using the Interview for Diagnosis of an Eating Disorder (IDED). Subjects underwent the

interview procedure following completion of the lexical decision task to avoid enhanced priming or demand effects.

The presentation of the words and nonwords was controlled by Micro Experimental Laboratory (MEL) software. Each stimulus was preceded by an orienting mark consisting of a plus sign (+). The plus sign remained on the screen for 1000 ms. and was replaced by a word or nonword letter string. Presentation of the stimuli was completely random for each subject and controlled by MEL. The subject was instructed to make a YES or NO decision, by pressing a keyboard button, as to whether the letter string displayed was a word or nonword. Following the subject's response instructions to rate the level of confidence in the YES/NO decision was displayed along with the 5-point rating scale from which subjects made the confidence rating. Level of confidence in a response was indicated by pressing the keyboard button 1 (No idea, just a guess), 2 (Hardly at all sure), 3 (Not sure, think so), 4 (Fairly certain), or 5 (Very certain). The accuracy of each lexical decision and the confidence rating was recorded by the MEL program.

In order to familiarize the subjects with the task a short practice session was conducted. The practice session consisted of 25 words and 25 nonwords presented in progressively shorter durations. The first 10

presentations lasted for 120 ms., the next 10 for 90 ms., the next 10 for 60 ms. and the last 20 stimuli were presented for 40 ms. Following the practice session, the 40 target words (20 body size and 20 food words), mask, 80 nonword letter strings and 80 matched neutral words were presented on the computer monitor. Responses by the subject terminated the display of the pattern mask, after which the 5-point rating scale and instructions to make a confidence rating were displayed. The sequence of each observation was as follows: plus sign, word or nonword, mask, and confidence rating. The subject's confidence rating response terminated one trial and started the next trial.

While sitting in front of the computer monitor subjects were asked to read the following instructions that were displayed on the screen:

In this experiment a word or a nonword letter string will be flashed on the monitor in front of you. This is what a nonword letter string may look like, e.g. spgart. You will see a plus sign (+) displayed on the monitor prior to the presentation of each word or non-word. You are to determine whether the letters displayed on the monitor make a word or do not make a word by pressing one of the two buttons marked **YES** and **NO**. If the letters make a word press

YES, if the letters do not make a word press NO.

Only one word or non-word will appear on the screen at a time. Make your decision as quickly as you can, but try to be sure your answer is right. Are there any questions? You will now be presented with a brief practice session. (After the practice session the subject was asked again if there were any questions).

After the subjects read the instructions the experimenter explained that the words or nonwords would be flashed on the monitor very fast, which may make it difficult to actually see the stimulus. As a result, the subject would frequently feel as though she was guessing and should go with the first impression or feeling as to whether a word or nonword was presented on the screen. It was explained further that it was possible to see the words or nonwords but they should respond with their best guess when unsure.

Upon completion of the lexical decision task a measure of recognition memory was administered. Subjects were handed a sheet of paper on which was typed all 80 of the words from the lexical decision task and an equal number of words that had not been part of the experimental task. Subjects were given a pencil and instructed to read each word carefully and circle all of the words they

recognized from the computer task. The number of words correctly recognized from each of the four groups and the number of foils circled was recorded. The recognition memory task was included to evaluate the extent to which words from the lexical decision task could be retrieved from memory. The information processing biases associated with body size preoccupation were hypothesized to be limited to a preattentive bias. The recognition memory task was included as an attempt to rule out the presence of biases in later stages of information processing, such as elaboration and retrievability. A memory bias has not been found to be associated with anxiety (Williams et al., 1988), and since this study was based on the anxiety model of eating disorders, it was predicted that no memory bias would be found between groups. The information processing model presented by Williams et al (1988) contends that memory biases are a function of elaboration which occurs after information has entered conscious awareness. If the words in this study reached awareness the extent to which they were processed could be evaluated by assessing memory for the words presented.

Following the recognition memory task the Shipley Vocabulary Subscale was administered, subjects were interviewed using the IDED to rule out the presence of an eating disorder and subjects were asked to report what

they had eaten over the last 24 hours. A pattern of responding that resulted in a hit rate of .90 for words and .10 for nonwords, or the reverse, was considered to be due to a biased response set and data from those subjects was disregarded. This criteria was arbitrary but was believed to be a strong indicator that a subject had adopted a strategy of indiscriminantly pressing one of the two keys over the other. These subjects were replaced by nonclinical subjects who did not exhibit a biased response set.

RESULTS

Data from a sample of 118 subjects from 3 groups representing subjects scoring high (≥ 110), middle (49-109) and low (≤ 50) on the Body Shape Questionnaire (BSQ) were analyzed. The high BSQ group (extreme body size preoccupation) contained 38 subjects; 41 subjects were included in the group of mid range scores on the BSQ (normal body size preoccupation); and 39 subjects were in the low BSQ group (very minimal body size preoccupation). Statistical analysis consisted of between group multivariate analysis of variance (MANOVA), follow-up analysis of variance (ANOVA), and contrasts (follow-up univariate F-tests). For all analyses, the alpha level was set at 0.05, Wilk's Lambda was used to interpret the results of all MANOVAs.

Demographic Variables

Group demographics (Table 1) were subjected to a one-way multivariate analysis of variance (MANOVA) with group as the independent variable and age, vocabulary skills and body mass index (BMI) as the dependent variables. This analysis was statistically significant ($F = 4.49$; $df = 6, 226$; $p < 0.0001$). Follow-up ANOVAs revealed that groups did not differ on age ($F = 0.32$; $df = 2, 117$; $p = 0.72$) or vocabulary skills ($F = 1.48$ $df = 2, 117$; $p = 0.23$), but did differ on BMI ($F = 12.16$; $df = 2, 117$ $p < 0.0001$).

The body mass index is calculated by dividing weight (in kilograms) by height (in meters) squared. Post hoc analysis, using Scheffe's Method, found that the low BSQ group had a significantly lower BMI (20.1) than both the high BSQ group and mid range BSQ group (22.7, and 21.7; respectively). Although there was a significant difference among groups, the discrepancy between means was small and the BMI values for all 3 groups were within the normal range. This small difference in BMI was interpreted as being clinically insignificant and therefore, group differences on BMI were not considered in subsequent analyses.

Response Bias

Prior to analyzing the accuracy data from the lexical decision task, groups were evaluated for the presence of a response bias. Even though the subjects who exhibited an extreme response set were eliminated from the data analysis, there remained a possibility that one or more of the groups favored one response over the other, e.g. subjects may have had a tendency to press the key marked YES more frequently and without discretion, over the NO key. Snodgrass and Corwin (1988) investigated several indices of bias and found that the Two-high-threshold theory index and the Signal Detection Theory (SDT) indices were the most appropriate measures of bias. Both models

Table 1

Group Demographics and Simple Statistics

<u>Variables</u>	<u>High BSQ</u>	<u>Middle BSQ</u>	<u>Low BSQ</u>
Mean age (yrs.)	22.3 ^a	23.0 ^a	21.9 ^a
Std. Dev.	5.8	6.9	6.3
Mean BMI	22.7 ^a	21.7 ^a	20.1 ^b
Std. Dev.	2.6	2.1	2.4
Mean Vocab score	30.0 ^a	28.6 ^a	29.1 ^a
Std. Dev.	3.5	3.6	4.1

Results of Analysis of Variance on Demographic Variables

<u>Source</u>	<u>df</u>	<u>F</u>	<u>p</u>
Age	2	0.32	0.72
Vocabulary	2	1.48	0.23
<u>BMI</u>	2	12.16	0.0001

Note. BSQ = Body Shape Questionnaire; yrs. = years; in. = inches; lbs = pounds; Std. Dev. = Standard Deviation; df = degrees of freedom; F = Test statistic; p = Probability that F is significantly different from zero; BMI = Body Mass Index; Vocab = Vocabulary score from the Shipley Institute of Living Scale; superscripts that are different indicate that groups differ on that variable ($p < 0.05$).

use hit rate and false alarms to evaluate response bias. However, Two-high-threshold theory index was found to be more sensitive to differences when performance was close to chance. That is, as performance approaches chance the Two-high-threshold theory index was more likely to detect the presence of a response bias than the SDT indices. Since it was hypothesized that performance associated with some of the groups of words in the lexical decision task would be close to chance, the Two-high-threshold theory index was used to assess for the presence of a response bias across groups ($\text{Bias Index} = \text{False Alarms} / [1 - (\text{Hits} - \text{False Alarms})]$). For this study, Hits were defined as correct YES responses to the four types of actual words presented in the lexical decision task, and False Alarms were YES responses to the nonwords. Four Bias Indexes were calculated for each subject, one for each group of words, i.e. body size words, neutral words matched with body size words, food words and neutral words matched with food words. Using the 4 Bias Indexes as the dependent variables and group as the independent variable a one-way MANOVA was run. Wilk's Lambda was used as the criterion and the alpha level was set at 0.05.

The MANOVA of the response bias data failed to find a significant difference among the groups ($F = 1.35$; $df = 8, 224$; $p = 0.22$). Hence, it was concluded the groups did

Table 2

Bias Indices For Each Wordtype Across Groups

<u>Wordtype</u>	<u>Mean/SD</u>	<u>High BSQ</u>	<u>Middle BSQ</u>	<u>Low BSQ</u>
Body size	Mean	0.54	0.53	0.49
	SD	0.16	0.15	0.14
Matched Body	Mean	0.53	0.53	0.48
	SD	0.18	0.15	0.13
Food	Mean	0.59	0.53	0.52
	SD	0.18	0.14	0.15
Matched Food	Mean	0.51	0.51	0.48
	SD	0.15	0.14	0.12

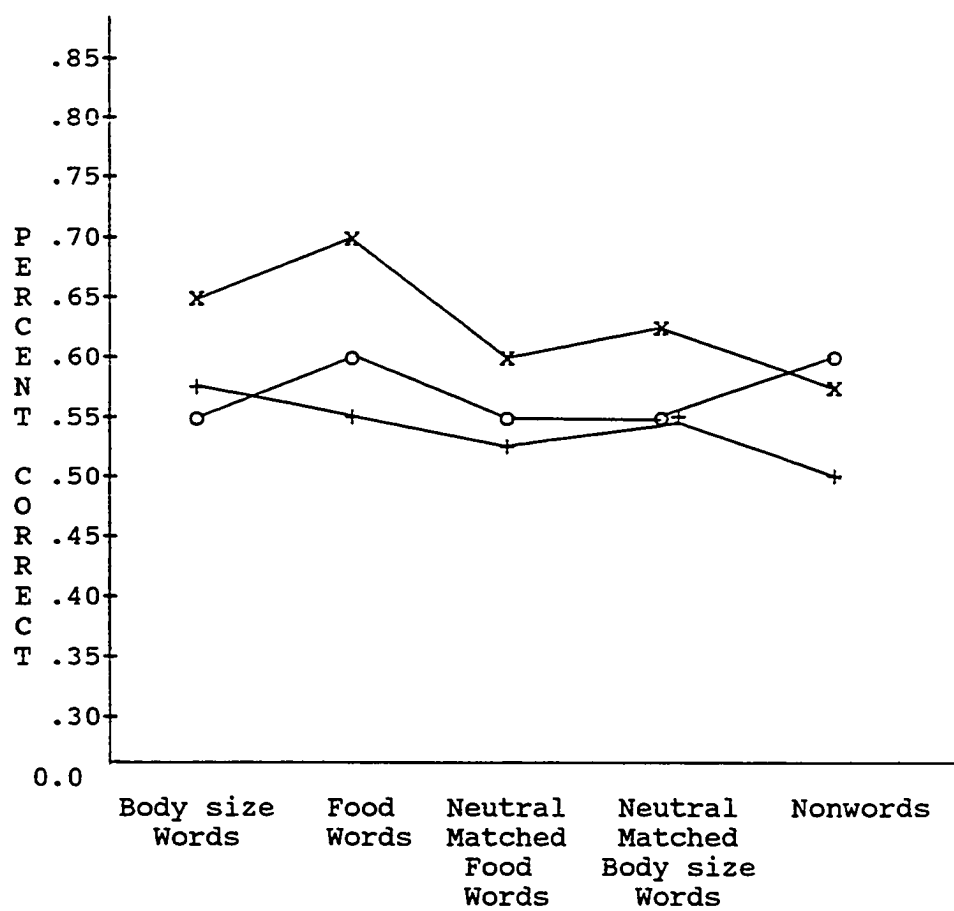
Note. BSQ = Body Shape Questionnaire; SD = standard deviation; Matched Body = neutral words matched with the body size words; Matched Food = neutral words matched with the food words.

not differ on degree of response bias toward any of the word stimuli presented in the lexical decision task. Group means and standard deviations for the Bias Indexes are presented in Table 2.

Accuracy Data

The five accuracy scores, which were defined as the percentage of correct responses to each wordtype during the lexical decision task, were submitted as the dependent variables in an one-way MANOVA with group as the independent variable. Using Wilk's Lambda and an alpha level of 0.05, results of the MANOVA indicated that the linear combination of dependent variables was affected by group membership ($F(10,222) = 2.9; p < 0.002$). Between group contrast analysis showed that the high BSQ group was significantly different than the mid range BSQ group on the linear combination of dependent variables ($F(5,111) = 5.29; p < 0.0002$) and approached significance with the low BSQ group ($F(5,111) = 2.12; p < 0.06$). The low BSQ group and mid range BSQ group were not significantly different on the linear combination of dependent variables ($F(5,111) = 1.64; p = 0.15$). A graph of the accuracy data for each wordtype across groups is provided in Figure 1. Group means and standard deviations for the lexical decision accuracy data are presented in Table 3.

Figure 1. Graph of the Accuracy Scores from the Lexical Decision Task



Note. x = High BSQ group; + = Middle BSQ group; o = Low BSQ group.

Table 3

Lexical Decision Task Accuracy Data (Mean Percent Correct)

<u>Wordtype</u>	<u>Mean/SD</u>	<u>High BSQ</u>	<u>Middle BSQ</u>	<u>Low BSQ</u>
Body size	Mean	0.64 ^a	0.57 ^{ab}	0.55 ^b
	SD	0.15	0.15	0.17
Matched Body	Mean	0.62 ^a	0.56 ^a	0.55 ^a
	SD	0.15	0.15	0.14
Food	Mean	0.71 ^a	0.56 ^b	0.61 ^b
	SD	0.14	0.17	0.17
Matched Food	Mean	0.59 ^a	0.54 ^a	0.54 ^a
	SD	0.13	0.15	0.14
Nonwords	Mean	0.57 ^{ab}	0.52 ^a	0.59 ^b
	SD	0.17	0.14	0.13

Note. BSQ = Body Shape Questionnaire; SD = standard deviation; Matched Body = Neutral words matched with the body size related words; Matched Food = Neutral words matched with the food words; superscripts that are different indicate groups differ on that variable ($p < 0.05$).

Contrast analyses, to assess group responses to the food and body size words (the body size and food word accuracy scores were used as the dependent variables), revealed significant group differences. A comparison of the high BSQ group and the low BSQ group on body size words showed the groups differed significantly ($F(1,115) = 5.38$; $p < 0.03$), but a comparison between the high BSQ group and mid range BSQ group on body size words only approached significance ($F(1,115) = 3.46$; $p = 0.065$). Contrasts between the low BSQ group and the mid range BSQ group on body size words were not significant ($F(1,115) = 0.24$; $p = 0.62$). Inspection of group means indicated that the high BSQ group correctly identified significantly more body size related words than the low BSQ group.

Contrast analysis between groups on the food word accuracy scores showed significant differences between the high BSQ group and both the low and mid range BSQ groups ($F(1,115) = 7.08$; $p < 0.009$; $F(1,115) = 15.87$; $p < 0.0001$; respectively). No significant difference was found between the low BSQ group and the mid range BSQ group ($F(1,115) = 1.69$; $p = 0.19$). Inspection of group means indicated that the high BSQ group correctly identified significantly more food words than either the low BSQ group or mid range BSQ group.

The prediction that the high BSQ group would be significantly more accurate in responding to body size and food words than matched neutral words was evaluated by within group MANOVA contrasts. The difference between the body size related words and the neutral words matched with the body size words was not significant ($F(1,115) = 0.44$; $p = 0.51$). The contrast analysis between the food words and the neutral words matched with the food words was significant, however ($F(1,115) = 19.90$; $p < 0.0001$). These results indicated that the high BSQ group was more accurate in responding to food words than matched neutral words, whereas responses to body size words and matched neutral words were not significantly different.

The within group MANOVA contrast between body size words and matched neutral words was not significant for either the low or mid range BSQ group ($F(1,115) = 0.002$; $p = 0.96$; $F(1,115) = 0.05$; $p = 0.82$; respectively). The within group contrast for the food words and matched neutral words was not significant for the mid range BSQ group ($F(1,115) = 1.18$; $p = 0.28$), but was significant for the low BSQ group ($F(1,115) = 7.26$; $p < 0.009$). Inspection of the means indicated that the low BSQ group was more accurate in response to food words than neutral words matched with the food words. Neither the low BSQ nor mid range BSQ group were more accurate in response to

body size words than neutral words matched with the body size words.

Confidence Ratings

As an awareness check subjects were asked to indicate how confident they were about the correctness of each response on a 5 point rating scale. The confidence rating occurred immediately after each YES/NO response. Five confidence scores, one for each wordtype, were obtained and submitted as the dependent variables in an one-way MANOVA, with Wilk's Lambda as the criterion variable and alpha level set at 0.05. Results indicated that groups differed significantly on the linear combination of dependent variables ($F(10,222) = 1.89, p < 0.05$). Between group analysis of variance with each wordtype as the dependent variable revealed a significant difference in response to food words ($F(2,117) = 5.01; p < 0.03$). Scheffe's post hoc test showed that the high BSQ group was significantly more confident about responses to food words than the mid range BSQ group. Group means and standard deviations are summarized in Table 4.

Recognition Memory

Following the lexical decision task subjects were given a sheet of paper containing 160 words and asked to circle all the words they recognized as being from the computer experiment. All of the words from the lexical

Table 4

Mean Confidence Ratings of Responses in the Lexical
Decision Task

<u>Wordtype</u>	<u>Mean/SD</u>	<u>High BSQ</u>	<u>Middle BSQ</u>	<u>Low BSQ</u>
Body size	Mean	2.43 ^a	1.98 ^a	2.19 ^a
	SD	0.99	0.80	0.87
Matched Body	Mean	2.34 ^a	1.98 ^a	2.12 ^a
	SD	0.95	0.82	0.80
Food	Mean	2.53 ^a	1.97 ^b	2.32 ^{ab}
	SD	1.03	0.84	0.91
Matched Food	Mean	2.32 ^a	1.92 ^a	2.1 ^a
	SD	0.96	0.79	0.82
Nonwords	Mean	2.10 ^a	1.89 ^a	1.97 ^a
	SD	0.80	0.75	0.82

Note. BSQ = Body Shape Questionnaire; SD = standard deviation; Matched Body = neutral words matched with the body size related words; Matched Food = neutral words matched with the food words; superscripts that are different indicate groups differ on that variable ($p < 0.05$).

decision task, plus an equal number of foils, were included in the recognition memory task. The number of words circled from each of the four groups of words (food words, body size words, matched neutral words, and foils) were recorded. Thus, four recognition memory scores were obtained and submitted as the dependent variables in an one-way MANOVA with group as the independent variable. The alpha level was set at 0.05 and Wilk's Lambda was used as the criterion variable. Results of the one-way MANOVA for the recognition memory data indicated no significant differences across groups ($F(8,224) = 1.89$; $p = 0.07$). Table 5 summarizes means and standard deviations for recognition memory.

Table 5

Recognition Memory Scores for Each Group

<u>Wordtype</u>	<u>Mean/SD</u>	<u>High BSQ</u>	<u>Middle BSQ</u>	<u>Low BSQ</u>
Body size	Mean	3.26	2.07	1.72
	SD	4.17	2.66	1.80
Food	Mean	3.55	2.73	3.16
	SD	3.64	3.38	3.72
Neutral	Mean	2.95	2.76	3.18
	SD	3.00	3.58	5.30
Distractors	Mean	3.47	4.63	4.74
	SD	4.20	6.57	8.33

Note. BSQ = Body Shape Questionnaire; SD = standard deviation; Neutral = both neutral words matched with the body size related words and neutral words matched with the food words; Distractors = words present on the recognition task that were not part of the lexical decision task.

DISCUSSION

Using a lexical decision task, this study investigated the extent to which body size preoccupation influenced information processing of words related to body size and food. The hypotheses in this study were that individuals reporting extreme body size preoccupation, as measured by the Body Shape Questionnaire (BSQ), would be more accurate in responding to words related to body size and food than individuals reporting significantly less concern for body size. The data from the lexical decision task supported the hypotheses. The high BSQ group was significantly more accurate in response to body size words than the low BSQ group and significantly more accurate than both the low BSQ and mid range BSQ groups on food words. These results suggest that individuals who were extremely concerned with their body size, and did not have a diagnosable eating disorder, identify briefly presented body size and food words more accurately than individuals with significantly less body size preoccupation.

It was also hypothesized that the high BSQ group's accuracy rate for body size and food words would be significantly greater than the corresponding accuracy rate for the neutral words matched on length and frequency with the body size and food words. The within group difference was not observed for the body size words but was found for

the food words. These within group results combined with the between group findings showed a strong selective information processing effect for food words, but only a weak processing bias effect for the body size words.

Along with significant between group differences on the lexical decision task, the low BSQ group had a significantly lower body mass index (BMI) than the mid range and high BSQ groups. These results suggest that selective processing of body size and food words may be associated with BMI. However, this assumption is not supported by the data. Although the low and mid BSQ groups differed on BMI there were no selective information processing differences between the two groups. Furthermore, the high and mid range BSQ groups differed on processing of food words but were not significantly different on BMI. Therefore, it is unlikely that BMI accounts for significantly more of the variance of selective information processing than body size preoccupation.

Although between group differences, suggestive of an information processing bias, were not found among the mid range BSQ group and low BSQ group, the low BSQ group did show a significant within group difference between food words and matched neutral words. The absence of between group differences on food words for the low BSQ group

limits the interpretability of this finding. However, this within group finding raises questions regarding the possibility of an information processing bias among subjects reporting very minimal body size preoccupation. If such a bias is present, it would limit the acceptability of using extremely low body size preoccupied subjects as a comparison group in future research.

Channon & Hayward (1990) found that food deprivation and hunger influenced information processing of food-related stimuli. One of the exclusion criteria in this study was low caloric intake, therefore degree of hunger is an unlikely explanation for the results associated with the food words.

The results of this study indicate that the selective processing of food words is likely a function of body size preoccupation. Since selective processing of food words has been a robust finding across studies of eating disorder subjects (Ben-Tovim, et al, 1989; Channon, et al, 1988) it may be that body size preoccupation is the major contributing factor to this phenomenon.

Since it was assumed that selective processing of body size- and food-related words occurs outside conscious awareness, an awareness check was included in the lexical decision task. As a measure of immediate awareness subjects in this study rated how confident they were as to

the correctness of their response to each stimulus word presented in the lexical decision task. Overall, confidence ratings were very low (mean rating for the entire sample was 2.14 which corresponds to "Hardly at all sure") and suggested that subjects were not consciously aware of the words being presented. Although the confidence ratings were extremely low, statistical analysis indicated that the high BSQ group was more certain about their responses to the food words than the mid range BSQ group. This finding suggests that the high body size preoccupied group was more aware of the stimuli when it was a food word than the mid range BSQ group. Such an increase of awareness could have produced a priming effect by activating mental representations corresponding to food items and enhancing the preattentive processing for later presentations of food words. However, this explanation is unlikely since the speed of word stimuli presentation used in this study has been reported to be outside the conscious awareness of normal subjects (Jacoby & Dallas, 1981; Hill & Kemp-Wheeler, 1989). Furthermore, subjects in this study frequently commented, either during or after the lexical decision task, that they could not see and were not aware of any words being flashed on the screen. From this information

it was assumed that the subjects were unaware of the words being used in the computer task.

According to Williams et al (1988) model of selective information processing, anxiety is not associated with a recall memory bias. Anxiety or fear results in priming of mental representations associated with the object viewed as threatening. Although priming enhances the detection of threatening stimuli, it does not augment the ability to retrieve the same threatening information from memory. Elaboration, the process by which a number of mental representations become associated into a cognitive network, is hypothesized to be the mechanism that enhances the retrievability of information from memory (Williams, et al., 1988). However, elaboration has not been found to occur with anxiety. The data from this study that would be associated with elaboration, i.e. recognition memory, showed no differences among the three groups. The recognition memory data from this study suggest that elaboration of body size and food words may not occur in response to very brief exposure to such stimuli.

Data from the recognition memory task show that the high body size preoccupied group recognized more words from both the food and body size categories than either the mid range or low BSQ group; however, these differences were not significant. Inspection of the means and

standard deviations from the recognition memory task reveals extreme variability across subjects as well as very poor ability to discriminate between words from the lexical decision task and foils. Thus, it is evident that the subjects in this study could not reliably recognize words that had been presented in the lexical decision task. This is consistent with other studies that have failed to find a memory bias in anxiety disordered subjects who selectively processed threat words (Mathews & MacLeod, 1986).

In contrast to the memory results in this study, two recent unpublished studies reported a recall memory bias for fat-related body size words (e.g. obese, cellulose) in a group of eating disorder subjects and normal weight subjects scoring high on the BSQ (Baker, Williamson, & Sylve, 1993; Sebastian, Williamson & Blouin, 1993). The failure of the present study to find a memory bias may be attributed to methodological differences between the studies. In the two studies reporting a memory bias, time of exposure to the stimulus words prior to the memory task was extremely long compared to exposure time during this study (10 seconds vs 35 milliseconds). This extended period of time may have allowed for more extensive processing and activation of associated representations, which aided in later retrieval of the words. It may also

be that both preattentive and elaborative processing biases occur as a result of extreme body size preoccupation. However, the duration of stimulus presentation may determine which information processing bias is observed.

In this study a preattentive processing bias was observed for food words in individuals reporting extreme body size preoccupation. A number of other studies have found similar results in eating disorder subjects (Ben-Tovim, et al., 1989; Channon, et al., 1988; Cooper, et al., 1992; Fairburn, et al., 1991). Research findings for a preattentive bias toward body size words has been more equivocal (Ben-Tovim, et al. 1989). The preattentive processing bias found in body size preoccupied subjects and eating disorder subjects suggests that food is easily identified as a threat to weight gain or weight loss and therefore quick detection and avoidance is enhanced.

The recent findings of a memory bias in subjects reporting the same level of body size preoccupation indicates that fat-related body size stimuli are elaborated. Since fatness has a ubiquitous negative connotation in Western cultures it is conceivable that fat-related stimuli are associated with a number of mental representations in individuals preoccupied with their body size. Such elaboration has been hypothesized to be a

mechanism that allows an individual to access possible solutions to be used to eliminate undesirable stimuli, such as fatness. Thus, individuals with extreme body size preoccupation may worry and ruminate about ways to reduce their body size, which leads to elaboration and a memory bias for fat-related body size words. For these same individuals fattening foods may be viewed as threatening stimuli and are, therefore, selectively processed.

This study did not find strong evidence for the selective processing of body size-related words by individuals who were extremely preoccupied with body size and weight. Although the high BSQ group correctly responded to the body size words significantly more often than the low BSQ group, the hypothesized within group difference between matched neutral words and body words was not significant. Hence, the high body size preoccupied group did not demonstrate the response pattern necessary to support the predicted information processing bias toward body size words.

The hypothesis related to the selective processing of food-related words, which was based on the content-specificity hypothesis (Greenberg & Beck, 1989) and the integration or primed mental representation explanation for attentional biases (Williams et al 1988), was supported. According to the content-specificity

hypothesis, an overconcern with body size and weight should result in an information processing bias toward body size- and weight-related stimuli. Williams et al (1988) would contend that such selective information processing is a result of primed mental representations associated with the stimuli of concern. As predicted by these two complementary theories, the high body size preoccupied group selectively processed food words. Given this finding, it is difficult to account for the failure of this study to support the prediction that individuals with high body size preoccupation would selectively process body size words.

Data from other studies suggest that the selective processing of body size-related stimuli is associated with an increase in preoccupation with body size and weight (Cooper, Anastasiades & Fairburn, 1992; Cooper & Fairburn, 1992; Mahamedi & Heatherton, 1993; Schotte, McNally & Turner, 1990). Each of these studies included a deliberate or inadvertent priming component that may have increased the degree of body size preoccupation, which would account for the observed information processing bias. Thus, it may be that mental representations related to body size are less active than structures associated with food and need further priming before a selective bias for body size-related stimuli occurs.

In summary, it appears that extreme body size preoccupation is associated with selective processing of food words. The information processing model presented by Williams et al (1988) states that selective processing is a function of an increased allocation of resources for the purpose of quickly detecting feared stimuli. Reallocation of resources is believed to be driven by anxiety and results in increased activation or priming of mental representations associated with the object viewed as threatening. Applying this model to the findings of this study indicates that anxiety, related to a fear of fatness, increases the activation or primes the mental representations associated with the threatening object (fattening foods), which results in selective processing of those foods viewed as fattening. The anxiety model of eating disorders, which states that extreme body size preoccupation is a result of a fear of fatness or fear of weight gain, has been supported by the results of this study.

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Appendix A
24-Hour Recall of Food Eaten

24-HOUR RECALL OF FOOD EATEN

Name _____ Date _____

From yesterday, record all foods and beverages eaten from the time you arose until the time you went to bed.

	Food eaten	Amount eaten	Calories
Morning Time: Place:			
Lunch Time: Place:			
Dinner Time: Place:			
Snacks Time: Place: Time: Place: Time: Place:			

Is this a typical day of eating? Y or N If yes, is it more or less than usual? more less

Appendix B
Lexical Decision Task Stimulus Words

Body Size Related Words

Porky (10)
 Heavy (110)
 Obese (5)
 Pudgy (1)
 Overweight (5)
 Cellulite (10)
 Hefty (1)
 Rotund (1)
 Bloated (3)
 Heavyside (1)
 Plump (4)
 Large (361)
 Chubby (2)
 Flabby (1)
 Fat (60)
 Portly (1)
 Blubber (1)
 Weight (91)
 Fatso (1)
 Chunky (2)

Matched Neutral Words

Basin (7)
 Ahead (109)
 Derby (7)
 Label (1)
 Cartridges (5)
 Calendars (11)
 Roomy (1)
 Feline (2)
 Nightly (3)
 Filament (1)
 Stead (5)
 White (355)
 Lather (3)
 Elapse (1)
 Dry (68)
 Medley (1)
 Chateau (3)
 Source (94)
 Yodel (1)
 Novice (3)

Note. Numbers in parentheses indicate mean word frequency in a sample of 1,014,232 words (Kucera & Francis, 1967)

Fattening Food Words

Pie (14)
 Sugar (34)
 Brownie (1)
 Pastry (4)
 Candy (16)
 Chocolate (9)
 Cheese (3)
 Pizza (3)
 Cream (20)
 Doughnut (5)
 Chips (3)
 Fries (6)
 Cookie (1)
 Butter (27)
 Sweets (2)
 Cake (13)
 Sausage (1)
 Bacon (10)
 Fudge (1)
 Lard (4)

Matched Neutral Words

Dot (13)
 Panel (31)
 Leaflet (1)
 Gadget (4)
 Attic (16)
 Chromatic (9)
 Clause (3)
 Brook (3)
 Clock (20)
 Airlines (5)
 Lends (4)
 Scrub (9)
 Tailor (2)
 Marble (21)
 Grassy (2)
 Curb (13)
 Preview (1)
 Array (11)
 Fleck (1)
 Vine (4)

Note. Numbers in parentheses indicate mean word frequency in a sample of 1,014,232 (Kucera & Frances, 1967)

VITA

Richard D. Fuller was born and raised in Salt Lake City, Utah. He majored in psychology and minored in chemistry at the Universtiy of Utah, where he graduated in 1987. He earned a master degree in psychology from Louisiana State University in 1991. He is currently married and has a beautiful 2 month old daughter.

DOCTORAL EXAMINATION AND DISSERTATION REPORT

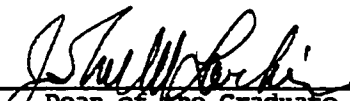
Candidate: Richard D. Fuller

Major Field: Psychology


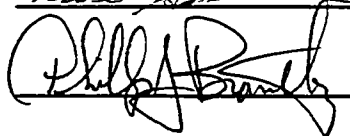
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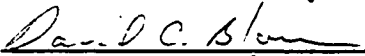
Approved:


Major Professor and Chairman

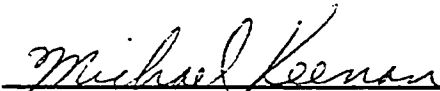

Dean of the Graduate School

EXAMINING COMMITTEE:







Date of Examination:

11-1-94
